



Europäisches Patentamt  
European Patent Office  
Office européen des brevets



Publication number:

**0 422 870 A3**

(12)

## EUROPEAN PATENT APPLICATION

(21) Application number: 90311001.3

(51) Int. Cl.<sup>5</sup>: **B41J 2/205**

(22) Date of filing: 08.10.90

(30) Priority: 10.10.89 GB 8922821  
23.01.90 GB 9001493

(43) Date of publication of application:  
17.04.91 Bulletin 91/16

(84) Designated Contracting States:  
**AT BE CH DE DK ES FR GB GR IT LI LU NL SE**

(88) Date of deferred publication of the search report:  
03.07.91 Bulletin 91/27

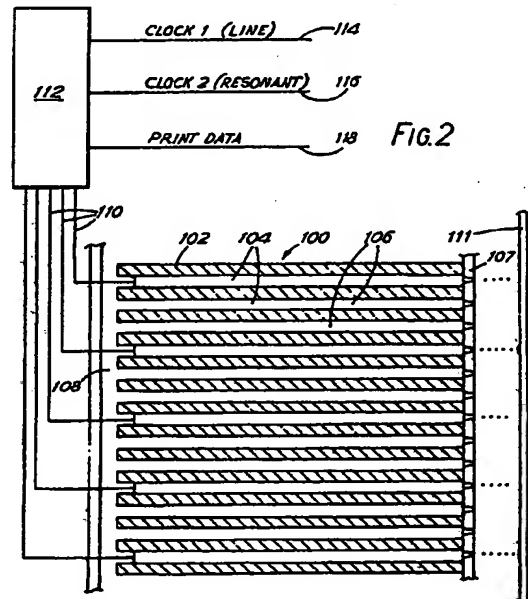
(71) Applicant: **XAAR LIMITED**  
Cambridge Science Park, Milton Road  
Cambridge CB4 4FD(GB)

(72) Inventor: **Paton, Anthony David**  
The Thatched Cottage, 51 Mills Lane  
Longstanton St. Michael, Cambridge(GB)  
Inventor: **Bartky, Walter Scott**  
5445 N. Sheridan Road  
Chicago, Illinois 60640(US)  
Inventor: **Michaelis, Alan John**  
22 W. 420 McCarron Road  
Glen Ellyn, Illinois 60137(US)

(74) Representative: **Coleman, Stanley et al**  
**MATHYS & SQUIRE** 10 Fleet Street  
London EC4Y 1AY(GB)

(54) Method of multi-tone printing.

(57) A method of multi-tone printing employs a drop-on-demand printing apparatus (100) for depositing ink droplets on printing element areas of a substrate (111) which is movable relative to said apparatus. The droplets are deposited from an array of channels (104) on substrate (111) which is movable relative to the channels. The channels length and nozzle location and dimensions afford each channel with a high longitudinal resonant frequency and electrically actuatable means (110,112,114,116,118) supply energy pulses to selected channels at or near the resonant frequency of the channels to deposit from each selected channel in the corresponding printing element area of the substrate a number of drops equal to the number of pulses applied thereto, the number of pulses applied being dependent on the tone of printing required. Single channel and colour versions of the invention are also disclosed.



EP 0 422 870 A3

BEST AVAILABLE COPY



European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number

EP 90 31 1001

BEST AVAILABLE COPY

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. CL5)
A	US-A-4536097 (NILSSON, KENTH) * abstract; figures * * column 3, line 57 - column 4, line 10 *	1-3, 6, 10-14 18, 19, 21-32, 34, 35, 37, 40 45	B41J2/205
A	GB-A-2157623 (EXXON RESEARCH AND ENGINEERING CO.) * abstract; figures 1-3 * * page 3, line 25 - page 4, line 59 *	1, 6, 8, 14-16, 22, 25 27, 33, 36, 37, 42, 44, 45	
D,A	US-A-4513299 (LEE, F.C. ET AL)		
A	EP-A-124190 (HEWLETT-PACKARD COMPANY)		
			TECHNICAL FIELDS SEARCHED (Int. CL5)
			B41J
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 03 MAY 1991	Examiner ROBERTS N.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	